REMARKS

I. Introduction

In response to the Office Action dated April 15, 2004, claims 1, 20 and 39 have been amended. Claims 1-57 remain in the application. Re-examination and re-consideration of the application, as amended, is requested.

II. Prior Art Rejections

A. The Office Action Rejections

In paragraphs (3)-(4) of the Office Action, claims 1, 18-20, 22-26, 30, 31, 33-39, 41-45, 49, 50, and 52-57 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sowar, U.S. Patent No. 5,351,196 (Sowar). In paragraph (5) of the Office Action, claims 2-17, 21, 27-29, 32, 40, 46-48, and 51 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sowar in view of Ji et al., "Machine Interpretation of CAD Data for Manufacturing Applications," ACM published September 1997, pages 264-311 (Ji).

Applicant's attorney respectfully traverses these rejections.

B. The Applicant's Independent Claims

Independent claims 1, 20 and 39 are generally directed to terminating profile sweeps for multiple bodies in a computer-implemented solid modeling system. Claim 1 is representative, and comprises the steps of:

(a) generating a planar profile of one or more curves;

(b) sweeping the profile along a specified path to generate a tool body; and

(c) terminating the swept profile, when the tool body interacts with a plurality of blank bodies to a predefined extent, using a graph-based method for multi-bodied sweep terminations.

C. The Sowar Reference

Sowar describes an invention relating to processes for the automatic generation of numerical control (NC) tool paths in a CAD/CAM environment. The present invention operates on mechanical parts described as solid models. The process employs well-defined solid models of the part to be machined and the raw stock from which it will be machined. The volumetric difference between the stock and the part defines the material (delta volumes) that must be cut away during the actual machining process. Delta volumes are solid models, and users (or an expert system) can

subdivide delta volumes into smaller volumes that are consistent with a manufacturing process plan. A delta volume and a user-defined strategy for machining the delta volume are then input to NC algorithms. The algorithms generate NC tool paths that remove as much delta volume material as possible. Tool volumes are automatically generated from NC tool paths to represent the volume traversed by the cutting tool. By subtracting the tool volume from the delta volume, the material that remains to be machined modeled and stored as new delta volumes. The subtraction of the tool volume from the stock defines a new stock model that represents the incremental change in stock when the NC tool path is processed at the machine tool. The process is repeated until all delta volumes have been machined and the part has been manufactured.

D. The Ji Reference

Ji describes machine interpretation of CAD data for manufacturing applications. Machine interpretation of the shape of a component for CAD databases is an important problem in CAD/CAM, computer vision, and intelligent manufacturing. It can be used in CAD/CAM for evaluation of designs, in computer vision for machine recognition and machine inspection of objects, and in intelligent manufacturing for automating and integrating the link between design and manufacturing. This topic has been an active area of research since the late '70s, and a significant number of computational methods have been proposed to identify portions of the geometry of a part having engineering significance (here called "features"). However, each proposed mechanism has been able to solve the problem only for components within a restricted geometric domain (such as polyhedral components), or only for components whose features interact with each other in a restricted manner. The purposes of this article are to review and summarize the development of research on machine recognition of features from CAD data, to discuss the advantages and potential problems of each approach, and to point out some of the promising directions future investigations may take. Since most work in this field has focused on machining features, the article primarily covers those features associated with the manufacturing domain. In order to better understand the state of the art, methods of automated feature recognition are divided into the following categories of methods based on their approach: graph-based, syntactic pattern recognition, rule-based, and volumetric. Within each category we have studied issues such as the definition of features, mechanisms developed for recognition of features, the application scope, and the assumptions made. In addition, the problem is addressed from the perspective of information input requirements and the advantages and disadvantages of boundary representation, constructive solid geometry

(CSG), and 2D drawings with respect to machine recognition of features are examined. Emphasis is placed on the mechanisms for attacking problems associated with interacting features.

E. The Applicant's Independent Claims Are Patentable Over the References

The Applicant's invention, as recited in independent claims 1, 20 and 39 is patentable over the references, because it contains limitations not taught by the references.

As noted in Applicant's specification, terminating profile sweeps is a fundamental operation in solid-modeling systems. Applicant's invention describes a new technique for handling the termination of a profile sweep when multiple blank bodies are involved. Specifically, nothing in the references teach or suggest terminating a swept profile that generates a tool body, when the tool body interacts with a plurality of blank bodies to a predefined extent, using a graph-based method for multi-bodied sweep terminations.

For example, Sowar refers to only a single blank body, not a plurality of blank bodies. Moreover, Sowar uses a projected constraint profile, known as a constraint volumes, which is intersected with a delta volume to define the volume which the tool must stay within, but does not teach or suggest using a graph-based method for multi-bodied sweep terminations.

The Ji reference does not overcome the deficiencies of the Sowar reference. Ji describes cell decomposition and the use of graph-based approaches, but does not teach or suggest Applicant's invention for handling the termination of a profile sweep that generates a tool body, when the tool body interacts with a plurality of blank bodies to a predefined extent, using a graph-based method for multi-bodied sweep terminations.

Because of these differences, it is respectfully asserted that Sowar and Ji does not anticipate or render obvious Applicant's independent claims 1, 20 and 39. Moreover, the various elements of Applicant's claimed invention together provide operational advantages over Sowar and Ji. In addition, Applicant's invention solves problems not recognized by Sowar and Ji.

Dependent claims 2-10, 22-30, and 32-40 are also submitted to be allowable over the references in the same manner, because they are dependent on independent claims 1, 20 and 39, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-10, 22-30, and 32-40 recite additional novel elements not shown by the references.

III. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicant's undersigned attorney.

Respectfully submitted,

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